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REVIEWS

Geology.—Reconnaissance of the Jarbidge, Contact and Elk Mountain Mining Districts, Nevada. By F. C. SCHRADER. Bull. U.S. Geological Survey No. 497, pp. 162, with maps, sections, and illustrations. 1912.

Geography.—The districts are in Elko County in northeastern Nevada near the Idaho state line. They are contained in an east-west rectangular area about 35 miles long by 26 miles wide, the Jarbidge district being in the western part, the Contact district in the eastern part, and the Elk Mountain district in the northern part. Geologically and mineralogically the Elk Mountain district is a small-scale replica of the Contact district.

The area is about 50 miles distant from the Twin Falls Branch of the Oregon Short Line Railroad on the north and from the Southern Pacific Railroad on the south. It lies in the northeastern part of the upland region known as the Nevada Plateau. It is mainly on the southern rim of the Snake River drainage basin, whence it extends across the divide and includes a small part of the adjacent Great Basin on the south. It lies at the general elevation of about 6,000 feet, but it is mostly mountainous and has a vertical range of nearly 6,000 feet and culminates at about 11,000 feet in the Jarbidge Mountains on the west. In the western part the drainage issues northward through the Bruneau River, and in the eastern part easterly, thence northward through the Salmon River, both rivers being main south-side tributaries of the Snake.

Geology.—The area is in a region of fundamentally Paleozoic sedimentary rocks seemingly Carboniferous. They consist principally of quartzite, limestone, shale, and slate, folded, faulted, intruded by Cretaceous (?) granodiorite, flooded and capped by Tertiary eruptives, principally rhyolite, and overlain by Tertiary lake beds and Quaternary gravel and alluvium.

In the Jarbidge district the rocks are principally rhyolites. Here the Paleozoic sediments are exposed only on the west. They consist, in ascending order, of quartzite, limestone, and shale aggregating about 3,000 feet (?) in thickness and they dip steeply to the north. The rhyolites are separable into two distinct groups, old rhyolite of Miocene (?) age and young rhyolite, Pliocene. Each consists of a series of superimposed flows.

The old rhyolite occupies a central area about 8 miles square, has a thickness of nearly 5,000 feet, and is the principal ore-bearing rock. Its flows are heavy, ill defined, and lie nearly horizontal. It is gently folded, faulted, and considerably fissured. It is coarse textured with large phenocrysts of wine-colored quartz and feldspar.

The young rhyolite surrounds the old rhyolite with wide extent. It has a maximum thickness of nearly 2,000 feet. It is non-ore-bearing and but little disturbed. Its flows are relatively thin, well banded, and dip gently outward. It is lithoidal or aphanitic with little or no visible quartz, the silica occurring mainly in the form of tridymite.

The principal rocks of the Contact district are the granodiorite and the Paleozoic sediments which it intrudes. The granodiorite occupies a central elongated quaquaversal east-west batholitic belt 25 miles long by 6 miles wide. Surrounding it in a belt several miles in width succeeds the overlying quaquaversally outward dipping Paleozoic sediments with a known thickness of about 1,600 feet. They are considerably contact metamorphosed by the magmatic intrusion of the granodiorite and both they and the granodiorite are intruded by complementary syenitic, aplitic, lamprophyric, and monzonite dikes. The rhyolite which occurs chiefly peripherally corresponds to the young rhyolite of the Jarbidge district with which it seems to be continuous. The old rhyolite of that district seems to thin and peter out on the western headwaters of the Salmon and does not appear in the Contact district.

The Tertiary lake beds of the area occur chiefly in low places in the Contact district where they have a known thickness of 400 feet. They are mainly gray "sandstone" composed of volcanic tuff which is chiefly pumiceous. In places they are tilted, flexed, and gently folded. They seem to be of Pliocene age and belong to the Humboldt formation.

The Quaternary deposits of the area include in the Jarbidge Mountains, besides recent stream gravels, débris, and wash from the hills, also some glacial accumulations of Pleistocene age.

Ore deposits.—The ores were deposited in at least two distinct periods of mineralization, Cretaceous (?) and post-Miocene.

The Cretaceous (?) deposits are chiefly auriferous and argentiferous copper ores. They occur mainly in the Contact district and consist principally of contact metamorphic deposits conforming to the contact zone of the granodiorite with the Paleozoic sedimentaries, and deposits in fissures. The contact metamorphic deposits contain much axinite, indicating that pneumatolitic action was an important agency in their origin. The fissure deposits are associated with the complementary dikes and contemporaneous or slightly later quartz veins, and include replacement deposits in the wall rock. They occur principally in the granodiorite. The fissures have a steep southerly dip.

The post-Miocene deposits are argentiferous gold ores. They occur in quartz-adularia fissure veins in the old rhyolite in the Jarbidge district. They were discovered late in 1909. The fissures are mostly contained in two main systems which converge downward. Those of the west system dip steeply to the east and those of the east system dip steeply to the west. The gangue is pseudomorphic after calcite and rhyolite and was deposited by ascending thermal solutions that dissolved out and replaced the earlier calcite gangue.

Sandstone of the Wisconsin Coast of Lake Superior. By FREDERIK TURVILLE THWAITES. Bull. No. XXV, Wisconsin Geol. and Nat. Hist. Surv. Pp. 117+viii. Plates XXIII. Madison, 1912.

The stratigraphic relations and geologic age of the red sandstones of the Lake Superior region have long been a subject of discussion arising from the fact that the older sandstones are closely allied to the Keweenawan while the younger beds partake more of the general characteristics of the Cambrian. The older sandstones are characteristically composed of arkose material and the strata are nearly always tilted. The younger group is almost wholly quartz sandstone, and its beds are generally horizontal. Both series, so far as known, are entirely devoid of organic remains. Former investigators recognized that the lower group was a part of the Keweenawan series, but opinions differed as to its relation to the upper; some held that the two were conformable, while others maintained that an unconformity existed and that the upper group probably corresponded to the Cambrian of southern Wisconsin, or its conformable downward extension.

One of the principal results of the present study was the conclusion that the upper quartz sandstone grades conformably downward into red shales and arkose sandstones which possess the same characters as the main body of the recognized Keweenawan sediments. As no conclusive evidence was discovered which tended to indicate that the two groups are unconformable, the facts are believed to warrant the belief that the sandstones form a single essentially conformable series. What has